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DSMD

MEMORANDUM FOR Walter C. Odom, Jr.
Chief, Administrative and Customer Services Division

From: Lawrence S. Cahoon
Acting Chief, Demographic Statistical Methods Division

Subject: SIPP 2001: Source and Accuracy Statement for the 9-Wave Longitudinal File (S&A-3)[1]

Attached is the Source and Accuracy Statement for the longitudinal file from the 9 waves of the 2001 Survey of Income and Program Participation (SIPP).

Attachment

cc:

A. Shields	(ACSD)	C. Nelson	(HHES)
T. Blatt	(DSD)	C. Popoff	
N. McKee		T. Palumbo	
Z. McBride		J. Hisnanick	
J. Eargle		A. Gottschalck	
P. Benton		J. Day	
M. Thrift		Q. Wang	
R. Kominski	(POP)	A. Jones Jr.	
M. O'Connell		J. Tin	
K. Bauman		S. Stern	
P. Salopek		M. Weismantle	
J. Fields		B. Downs	
		L. Cahoon	(DSMD)
		SIPPB	

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[1]This source and accuracy statement can also be accessed through the U.S. Census Bureau website at "http://www.sipp.census.gov/sipp/sourceac/S&A01_20050610_Long(S&A-3).pdf."

SOURCE AND ACCURACY STATEMENT FOR THE SURVEY OF INCOME AND PROGRAM PARTICIPATION (SIPP) 2001, 9-WAVE LONGITUDINAL FILE[1]

DATA COLLECTION AND ESTIMATION

Source of Data. The data were collected in the 2001 Panel of the Survey of Income and Program Participation (SIPP). The population represented (the population universe) in the 2001 SIPP is the civilian noninstitutionalized population living in the United States. The institutionalized population, which is excluded from the population universe, is composed primarily of the population in correctional institutions and nursing homes (91 percent of the 4.1 million institutionalized people in Census 2001). The population includes people living in group quarters, such as dormitories, rooming houses, and religious group dwellings. Crew members of merchant vessels, Armed Forces personnel living in military barracks, and institutionalized people, such as correctional facility inmates and nursing home residents, were not eligible to be in the survey. Also, United States citizens residing abroad were not eligible to be in the survey. Foreign visitors who work or attend school in this country and their families were eligible; all others were not eligible to be in the survey. With the exceptions noted above, people who were at least 15 years of age at the time of the interview were eligible to be in the survey.

The 2001 Panel of the SIPP sample is located in 322 Primary Sampling Units (PSUs), each consisting of a county or a group of contiguous counties. Within these PSUs, living quarters (LQs) were systematically selected from lists of addresses prepared for the 1990 decennial census to form the bulk of the sample. To account for LQs built within each of the sample areas after the 1990 census, a sample containing clusters of four LQs was drawn of permits issued for construction of residential LQs up until shortly before the beginning of the panel.

In jurisdictions that don't issue building permits or have incomplete addresses, we systematically sampled expected clusters of four LQs which were listed by field personnel and then subsampled in the field. In addition, we selected sample LQs from a supplemental frame that included LQs identified as missed in the 1990 census.

For the first interview of the panel in Wave 1, we obtained interviews from occupants of about 35,100 of the 40,500 eligible living quarters. We found most of the remaining 15,400 living quarters in the panel to be vacant, demolished, converted to nonresidential use, or otherwise ineligible for the survey. However, we did not interview approximately 5,400 of the 15,400 living quarters in the panel because the occupants: (1) refused to be interviewed, (2) could not be found at home, (3) were temporarily absent, or (4) were otherwise unavailable. Thus, occupants of about 87 percent of all eligible living quarters participated in the first interview of the panel.

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[1]For questions or further assistance with the information provided in this document contact: Tracy Mattingly of the Demographic Statistical Methods Division on 301/763-6445 or via the email at Tracy.L.Mattingly@census.gov.

For subsequent interviews, only original sample people (those in Wave 1 sample households and interviewed in Wave 1) and people living with them were eligible to be interviewed.
We followed original sample people if they moved to a new address, unless the new address was more than 100 miles from a SIPP sample area. Then, we attempted telephone interviews.

Sample households within a given panel are divided into four random subsamples of nearly equal size. These subsamples are called rotation groups and one rotation group is interviewed each month. Each household in the sample was scheduled to be interviewed at 4-month intervals over a period of roughly 3 years beginning in February 2001. The reference period for the questions is the 4-month period preceding the interview month. In general, one cycle of four interviews covering the entire sample, using the same questionnaire, is called a wave.

The public use files include core and supplemental (**topical module**) data. Core questions are repeated at each interview over the life of the panel. Topical modules include questions which are asked only in certain waves.

The period covered by the 2001 9-Wave longitudinal file consists of 36 interview months (nine interviews) conducted from February 2001 to January 2004. Data for up to 39 reference months are available for persons on the file. Specific months available depend on the person's rotation group and his/her sample entry or exit date. However, data for all four rotation groups (i.e., the full sample) are available only for reference months January 2001 through September 2003, inclusive. Also note that the availability of data on household composition begins with the first interview month of a rotation group.

Table 1 indicates the reference months for each interview month for the 2001 Panel. For example, rotation group 2 of the 2001 Panel was first interviewed in March 2001 to collect data for the reference months November 2000 through February 2001. This rotation group was interviewed for the ninth time in November 2003 to collect data for July 2003 through October 2003. Table 1 also shows that calendar year 2001 (CY01) data were collected in interview months February 2001 through April 2002 and that calendar year 2002 (CY02) were collected exactly one year later. Similarly, calendar year 2003 (CY3) data were collected in February 2003 though January 2004, data had to be imputed for the six missing rotation months. Data from all four rotation groups are available for each reference month of the calendar years 2001, 2002 and 2003.

For entire panel, CY01, CY02 and CY03 weighting procedures, a person was classified as interviewed or noninterviewed based on the following definitions. (NOTE: A person may be classified differently for calculating different weights.) Interviewed sample persons (including children) were defined to be:

1) those for whom self, proxy, or imputed responses were obtained for each month of the appropriate longitudinal period, or

2) those for whom self or proxy responses were obtained for the first month of the appropriate longitudinal period and self, proxy, or imputed responses exist for each subsequent month until they were known to have died or moved to an ineligible address (foreign HUs, institutions, or military barracks).

The months for which persons were deceased or residing in an ineligible address were identified on the file. Noninterviewed persons were defined to be those for whom neither self nor proxy responses were obtained for one or more months of the appropriate longitudinal period (excluding imputed persons and persons who died or moved to an ineligible address).

It is estimated that roughly *90,400*[2] people were initially designated in the sample. Approximately *89,141* people were interviewed in Wave 1; however, we did not interview approximately 5,400 of the living quarters in the panel because the occupants, (1) refused to be interviewed, (2) could not be found at home, (3) were temporarily absent, or (4) were otherwise unavailable. Thus, occupants of about 87 percent of all eligible living quarters participated in the first interview of the panel. For the CY01, CY02, CY03 and 9-Wave (panel) weighting procedures, the eligible sample is considered to be all people initially designated for sample except household who are erroneously identified as members of a wave 1 sample. In the panel weighting procedure, approximately 49,700 people were classified as interviewed with a person nonresponse rate of 35.1%. The CY01 weighting procedure classified about 62,600 people as interviewed and had a person nonresponse rate of 18.3%. The CY02 weighting procedure classified about 58,400 people as interviewed and had a person nonresponse rate of 16.5%. The CY03 weighting procedure classified about 57,900 people as interviewed and had a person nonresponse rate of 15.2%. The panel weighting file contain approximately 104,600 person records in all. This includes the Wave 1 interviewed people and about 14,100 people who entered survey households during the panel through births, marriages, and other reasons. The CY weighting files also contain approximately 104,600 person records in all.

ESTIMATION

The SIPP program produces weights for both cross-sectional and longitudinal analysis. For information regarding cross-sectional estimation, please see the Source and Accuracy Statement for the 2001 Panel Wave 1 - Wave 9 Public Use File (see www.sipp.census.gov/sipp/sourceac/s&a01_20050428.Long.pdf). What follows is an overview of the longitudinal estimation.

In the estimation procedure described here, all people classified as interviewed for the longitudinal period (i.e., panel, CY01, CY02 and CY03) are assigned positive weights for that period, while those classified as non-interviewed are assigned zero weights.

Estimation of Person Characteristics. Essentially, the same estimation procedure was used to

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[2] All values given in italics in this paragraph are estimates.

derive each of the three sets of SIPP longitudinal person weights. We used several stages of weight adjustments in the estimation procedure to derive the SIPP person level longitudinal weights. We gave each person a base weight equal to the inverse of probability of selection of a person's household. We applied two noninterview adjustment factors. One adjusted the weights of interviewed people in interviewed households to account for households which were eligible for the sample but which field representatives could not interview at the first interview. The second compensated for person noninterviews occurring in subsequent interviews.

An additional stage of adjustment to longitudinal person weights was performed to reduce the mean square error of the survey estimates. This was accomplished by bringing the sample estimates into agreement with estimates from the 1990 decennial census which have been adjusted for undercount and to reflect births, deaths, immigration, emigration, and changes in Armed Forces since 1990.

Use of Person Weights. Each person within each household that has ever been in the entire 2001 Panel of SIPP has a 9-Wave longitudinal weight for estimation. A calendar year longitudinal weight is available each person within each household that was ever in the four waves of a specific calendar year. These weights may be zero for a particular individual if they are not classified as interviewed for the longitudinal period during the estimation procedure. The 9-Wave panel weight can be used to form monthly, quarterly, annual, or multi-year estimates for calendar years 2001 through 2003. The calendar year weight can be used to form monthly or quarterly estimates within a specific calendar year.

> **Example**, using the 9-Wave panel weight, one can estimate the number of people receiving TANF from January 2001 to January 2003. Using the CY03 weight, one can estimate the number of people receiving TANF for the third quarter of 2003.

Users should be forewarned to apply the appropriate weights given on weighting files before attempting to calculate estimates. The weights vary between units due to weighting adjustments, and following movers. If analysis is done for the general population without applying the appropriate weights, the results will be erroneous.

All estimates may be divided into two broad categories: longitudinal and cross-sectional. Longitudinal estimates require that data records for each person be linked across interviews, where as cross-sectional estimates do not. For example, annual income estimates obtained by summing the 12 monthly income amounts for each person would require linking records and so would be longitudinal estimates. Because there is no linkage between interviews, cross-sectional estimates can combine data from different interviews only at the aggregate level. Longitudinal person weights were developed for longitudinal estimation, but may be used for cross-sectional estimation as well. However, note that wave files with cross-sectional weights are also produced for the SIPP. Because of the larger sample size with positive weights available on the wave files, it is recommended that these files be used for cross-sectional estimation, if possible.

In this section, it is assumed that all four rotation groups are used for estimation. If an estimate covers a time period for which data from some rotation groups are unavailable, refer to the section "Adjusting Estimates Which Use Less Than the Full Sample."

Some basic types of longitudinal and cross-sectional estimates which can be constructed using longitudinal person weights are described below in terms of estimated numbers. Of course, more complex estimates, such as percentages, averages, ratios, etc., can be constructed from the estimated numbers. Longitudinal person weights can be used to construct the following types of longitudinal estimates:

1. The number of people who have ever experienced a characteristic during a given time period.

   To construct such an estimate, use the longitudinal person weight for the shortest time period which covers the entire time period of interest. Then, sum the weights over all people who possessed the characteristic of interest at some point during the time period of interest. For example, to estimate the number of people who ever received food stamps during the last six months of 2001, use the CY01 longitudinal weights. The CY01 weights cover the last six months of 2001 The same estimate could be generated using the 9-Wave panel longitudinal weights, but there may be fewer positively weighted people than in the calendar year.

2. The amount of a characteristic accumulated by people during a given time period.

   To construct such an estimate, use the longitudinal person weight for the shortest time period which covers the entire time period of interest. Then compute the product of the weight times the amount of the characteristic and sum this product over all appropriate people. For example, to estimate the aggregate 2001 annual income of people who were employed during all 12 months of the year, use the CY01 longitudinal weights. The same estimate could be generated using the 9-Wave panel longitudinal weights.

3. The average number of consecutive months of possession of a characteristic (i.e., the average spell length for a characteristic) during a given time period.

   For example, one could estimate the average length of each spell of receiving food stamps during 2001. Also, one could estimate the average spell of unemployment that elapsed before a person found a new job. To construct such an estimate, first identify the people who possessed the characteristic at some point during the time period of interest. Then, create two sums of these person's appropriate longitudinal weights: (1) sum the product of the weight times the number of months the spell lasted and (2) sum the weights only. Now, the estimated average spell length in months is given by (1) divided by (2). A person who experienced two spells during the time period of interest would be treated as two people and appear twice in sums (1) and (2). An alternate method of calculating the average can be found in the section "Standard Error of a Mean or Aggregate."

4. The number of month-to-month changes in the status of a characteristic (i.e., number of transitions) summed over every set of two consecutive months during the time period of interest. To construct such an estimate, sum the appropriate longitudinal person weight each time a change is reported between two consecutive months during the time period of interest. For example, to estimate the number of people who changed from receiving food stamps in July 2001 to not receiving in August 2001, add together the CY01 longitudinal weight of each person who had such a change. To estimate the number of changes in monthly salary income during the third quarter of 2001, sum together the estimate of number of people who made a change between July 1 and August 1, between August 1 and September 1, and between September 1 and October 1.

Note that spell and transition estimates should be used with caution because of the biases that are associated with them. Sample people tend to report the same status of a characteristic for all four months of a reference period. This tendency results in a bias toward reported spell lengths that are multiples of four months. This tendency also affects transition estimates in that, for many characteristics, the number of characteristics, the number of month-to-month transitions reported between the last month of one reference period and the first month of the next reference period are much greater than the number of reported transitions between any two months within a reference period. Additionally, spells extending before or after the time period of interest are cut off (censored) at the boundaries of the time period. If they are used in estimating average spell length, a downward bias will result.

Also using longitudinal person weights one can construct the following type of cross-sectional estimate:

5. Monthly estimates of a characteristic averaged over a number of consecutive months.

For example, one could estimate the monthly average number of food stamp recipients over the months July through December 2001. To construct such an estimate, first form an estimate for each month in the time period of interest. Use the longitudinal person weight, summing over all people who possessed the characteristic of interest during the month of interest. Then, sum the monthly estimates and divide by the number of months. Either the CY01 or the 9-Wave panel longitudinal weights can be used for this calculation.

Estimation of Household Characteristics. The Census Bureau has not developed household and family weights for longitudinal analysis. However, to facilitate exploratory research based upon the Census Bureau's provisional longitudinal household definition, two different longitudinal household weights, termed adjustment factor 1 and adjustment factor 2, were created for each longitudinal household each month. These factors were then assigned to every member of the longitudinal household each month. The primary difference between the factors is that for married-couple households adjustment factor 1 was derived jointly from the panel longitudinal person weights of the householder and spouse, while adjustment factor 2 was derived solely from the panel longitudinal person weight of the householder.

For each month, five data fields are included on the longitudinal panel file to facilitate creation of household-level estimates: (1) current household type, (2) key person, (3) other household member, (4) adjustment factor 1, (5) adjustment factor 2. Definitions of fields (1) through (3) as well as the provisional definitions of longitudinal household, original household, and successor household are provided below. In this section "month" refers to reference month unless stated otherwise:

LONGITUDINAL HOUSEHOLD: A longitudinal household is a household which exists during at least one month, but which may continue to exist for more than one month. A longitudinal household continues from one month to the next, if it has the same householder (and spouse, if present in the household), and if it is the same household type, where household type is defined below.

CURRENT HOUSEHOLD TYPE: Households are classified by type in the current month where household types are: (1) married-couple household, (2) other family household, male householder, (3) other family household, female householder, (4) non-family household, male householder, (5) non-family household, female householder.

ORIGINAL HOUSEHOLD: A household existing at the beginning of the survey, i.e., a household which exists during the first interview month of the rotation group.

SUCCESSOR HOUSEHOLD: A household which is not an original household but which does exist during at least one month as an off-shoot of an original household. A successor household must exist during at least one month succeeding the first interview month of the rotation group, and must have a key person (see definition below) who was a member of an original household.

KEY PERSON: In married-couple longitudinal households, both the householder and the householder's spouse are key persons. In all other types of longitudinal households, there is only one key person - the householder. In married-couple households, at least one key person must have entered the sample at Wave 1. In all other household types, the key person must have entered the sample at Wave 1.

OTHER HOUSEHOLD MEMBER: A person who, during a specific month, is a member of a longitudinal household but is not a key person.

Adjustment factors 1 and 2 are presented in Figure 1. In examining Figure 1, keep the following principles in mind: Adjustment factors 1 and 2 are always derived from the panel longitudinal person weight(s) of an original householder (and/or key person). For every successor household, where the current month householder (and/or spouse) was a member of an original household, it is the householder (and/or spouse) of the original household who supplies the panel longitudinal person weight from which the adjustment factors are derived.

Figure 1. Adjustment Factors for Longitudinal Household Estimates - 2001 9-Wave Longitudinal File

<table>
<tr><th rowspan="4"></th><th colspan="2">ORIGINAL HOUSEHOLDS</th><th colspan="6">SUCCESSOR HOUSEHOLDS</th></tr>
<tr><th rowspan="3">Married Couple</th><th rowspan="3">Other</th><th colspan="4">Married Couple</th><th colspan="2">Other</th></tr>
<tr><th colspan="2">HHer entered sample in Wave 1</th><th colspan="2">HHer entered in Wave 2+</th><th rowspan="2">HHer entered sample in Wave 1</th><th rowspan="2">HHer entered sample in Wave 2+</th></tr>
<tr><th>Other KP entered sample in Wave 1</th><th>Other KP entered sample in Wave 2+</th><th>Other KP entered sample in Wave 1</th><th>Other KP entered sample in Wave 2+</th></tr>
<tr><td>AF1</td><td>mean LPW of two key persons</td><td>LPW of Hher</td><td>first monthly value of AF1</td><td>½ first monthly value of AF1</td><td>½ first monthly value of AF1</td><td>Zero[3]</td><td>first monthly value of AF1</td><td>Zero[3]</td></tr>
<tr><td>AF2</td><td>LPW of HHer</td><td>LPW of HHer</td><td>first monthly value of AF2</td><td>First monthly value of AF2</td><td>Zero[3]</td><td>Zero[3]</td><td>first monthly value of AF2</td><td>Zero[3]</td></tr>
</table>

AF1 = Adjustment factor 1
AF2 = Adjustment factor 2
LPW = Panel longitudinal person weight
Wave 2+ = Wave 2 or later wave
HHer = Current month householder
KP = Current month key person

Note: The situation where a successor household is formed by the merging of two Wave 1 households is not covered in figure 1. Original sample persons who moved into another sample household cannot be linked to their original household and so are treated as if they entered the sample in Wave 2+.

Use of Household Weights. Adjustment factor 1, adjustment factor 2, and the related data fields are intended to provide the basis for exploratory household and family estimates. For example, by using adjustment factor fields for key persons (in married-couple households, one key person must be selected) with additional variables, estimates pertaining to longitudinal households can be derived for statements equivalent to the following: “During the period from month ‘A’ to

[3]These cells are added for completeness. By definition, these are not successor households.

month ‘B’, there were ‘C’ households with characteristics ‘D’.” An example of such a statement would be: “During the period from January to December 2001, there were ‘C’ households which received food stamps for 10 or more months.” All such estimates should be considered exploratory, because the adjustment factors do not explicitly take into account several possible sources of bias, including differential attrition from the sample, with the result that the estimates may, even as national estimates, be subjected to substantial bias. The purpose of including these data fields on the longitudinal panel file is to facilitate analyses that may be useful in developing improved longitudinal household weights. Although the exploratory adjustment factors may be useful for other purposes, the Census Bureau intends that these factors be used for only this one purpose.

Exploratory household (family) estimates can be formed using either adjustment factor 1 or adjustment factor 2. At present, there is insufficient evidence to recommend one factor over the other in any given situation. To form exploratory household (family) estimates, use the adjustment factor deemed appropriate, summing over all households (families) possessing the characteristic of interest. Note that both adjustment factors for a household will remain the same for each month the household exists. Therefore, the appropriate adjustment factor for a household can be taken from any month of a household’s existence. Also, note that the adjustment factors assigned to each member of a household actually apply to the entire household. As an example of the use of these adjustment factors, suppose one had an independent estimate of the number of households which received food stamps for 10 months or more during 2001 and wanted to compare it to the SIPP estimate. To construct the SIPP estimate, first, using appropriate data fields (e.g., current household type, key person), identify all households which existed for exactly 10, 11, and 12 months during 2001; then sum adjustment factor 1 or adjustment factor 2 over all of the identified households which received food stamps for the appropriate time period.

Adjusting Estimates Which use Less than the Full Sample. When estimates for months with less than four rotations worth of data are constructed from a wave file, factors greater than 1 must be applied. However, when core data from consecutive waves are used together, data from all four rotations may be available, in which case the factors are equal to 1.

All four rotation groups of data are not available for reference months October 2000 through December 2000 and October 2003 through December 2003 (see Table 1). If the time period of interest for a given estimate (of person or household characteristics) includes these months, the estimate may need to be adjusted in some way to account for the missing rotation groups. For longitudinal estimates (types 1-4), this adjustment factor equals four divided by the number of rotation groups contributing data. For example, if the time period of interest for a given estimate is October 2000, then data will be available only from rotation group 1. Therefore, a factor of 4/1 = 4.0000 will be applied. To estimate the number of people ever unemployed in the fourth quarter of 2003, only data from six months is available. Thus, a factor of 1.8519 will be applied. See Table 3 for more information.

Note that, if the given estimate is an average of monthly estimates (estimate type 5), then the number of rotation groups and the factor used will be determined independently for each month in the average and the adjusted monthly estimates will be averaged together in the usual way. For example, to estimate the average number of people unemployed per month in the fourth quarter of 2003, the October, November, and December data will be multiplied by 4/3, 4/2, and 4/1 respectively before being summed together and divided by three.

ACCURACY OF ESTIMATES

SIPP estimates are based on a sample; they may differ somewhat from the figures that would have been obtained if a complete census had been taken using the same questionnaire, instructions, and enumerators. There are two types of errors possible in an estimate based on a sample survey: nonsampling and sampling. We are able to provide estimates of the magnitude of SIPP sampling error, but this is not true of nonsampling error. Found in the next sections are descriptions of sources of SIPP nonsampling error, followed by a discussion of sampling error, its estimation, and its effect in data analyses.

Nonsampling Error. Nonsampling errors can be attributed to many sources:

- inability to obtain information about all cases in the sample
- definitional difficulties
- differences in the interpretation of questions
- inability or unwillingness on the part of the respondents to provide correct information
- inability to recall information
- errors made in the following: collection such as in recording or coding the data, processing the data, estimating values for missing data
- biases resulting from the differing recall periods caused by the interviewing pattern used
- and undercoverage.

Quality control and edit procedures were used to reduce errors made by respondents, coders and interviewers. More detailed discussions of the existence and control of nonsampling errors in the SIPP can be found in the *SIPP Quality Profile, 1998 SIPP Working Paper Number 230, issued May 1999*.

Undercoverage in SIPP results from missed living quarters and missed people within sample households. It is known that undercoverage varies with age, race, and sex. Generally, undercoverage is larger for males than for females and larger for Blacks than for non-Blacks. Ratio estimation to independent age-race-sex population controls partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates to the extent that people in missed households or missed people in interviewed households have characteristics different from those of interviewed people in the same age-race-sex group. Further, the independent population controls used have been adjusted for undercoverage in the Census.

A common measure of survey coverage is the coverage ratio, the estimated population before ratio adjustment divided by the independent population control. For an example of SIPP's coverage, Table A below shows SIPP coverage ratios for age-sex-race groups for the Panel weights prior to the final weighting adjustment. The SIPP coverage ratios exhibit some variability from month to month, but these are a typical set of coverage ratios. Other Census Bureau household surveys [like the Current Population Survey] experience similar coverage.

Comparability with Other Estimates. Caution should be exercised when comparing data from this with data from other SIPP products or with data from other surveys. The comparability problems are caused by such sources as the seasonal patterns for many characteristics, different nonsampling errors, and different concepts and procedures. Refer to the *SIPP Quality Profile* for known differences with data from other sources and further discussions.

Sampling Variability. Standard errors indicate the magnitude of the sampling error. They also partially measure the effect of some nonsampling errors in response and enumeration, but do not measure any systematic biases in the data. The standard errors for the most part measure the variations that occurred by chance because a sample rather than the entire population was surveyed.

Table A. SIPP Average Coverage Ratios for the Panel Weighting - Age by Non-Black/Black Status and Sex

	Non-Black		Black	
Age	**Male**	**Female**	**Male**	**Female**
15	0.93369	0.83502	0.86924	0.94229
16-17	0.88070	0.89253	0.86479	0.86696
18-19	0.80436	0.82684	0.79980	0.74815
20-21	0.78292	0.83863	0.79365	0.78594
22-24	0.80080	0.84288	0.74597	0.78397
25-29	0.87814	0.90715	0.73667	0.89102
30-34	0.87439	0.89138	0.73846	0.80479
35-39	0.87847	0.92643	0.75410	0.84855
40-44	0.91005	0.92543	0.79182	0.93026
45-49	0.89471	0.88661	0.83249	0.92590
50-54	0.86603	0.90069	0.84164	0.94123
55-59	0.91648	0.91201	0.94382	0.89658
60-61	0.85671	0.87556	0.96155	0.89512
62-64	0.94202	0.93340	0.97540	0.90149
65-69	0.94527	0.92828	1.00310	1.06891
70-74	0.96827	0.96022	0.89716	0.86318
75-79	0.95755	0.87255	0.00000	0.97459
80-84	0.87279	0.96984	0.00000	0.00000
85+	0.89190	0.95531	0.00000	0.00000

USES AND COMPUTATION OF STANDARD ERRORS

Confidence Intervals. The sample estimate and its standard error enable one to construct confidence intervals, ranges that would include the average result of all possible samples with a known probability. For example, if all possible samples were selected, each of these being surveyed under essentially the same conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then:

1. Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate would include the average result of all possible samples.

2. Approximately 90 percent of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average result of all possible samples.

3. Approximately 95 percent of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average result of all possible samples.

The average estimate derived from all possible samples is or is not contained in any particular computed interval. However, for a particular sample, one can say with a specified confidence that the average estimate derived from all possible samples is included in the confidence interval.

Hypothesis Testing. Standard errors may also be used for hypothesis testing, a procedure for distinguishing between population characteristics using sample estimates. The most common types of hypotheses tested are 1) the population characteristics are identical versus 2) they are different. Tests may be performed at various levels of significance, where a level of significance is the probability of concluding that the characteristics are different when, in fact, they are identical.

To perform the most common test, compute the difference $X_A - X_B$, where X_A and X_B are sample estimates of the characteristics of interest. A later section explains how to derive an estimate of the standard error of the difference $X_A - X_B$. Let that standard error be S_{DIFF}. If $X_A - X_B$ is between -1.6 times S_{DIFF} and +1.6 times S_{DIFF}, no conclusion about the characteristics is justified at the 10 percent significance level. If, on the other hand, $X_A - X_B$ is smaller than -1.6 times S_{DIFF} or larger than +1.6 times S_{DIFF}, the observed difference is significant at the 10 percent level. In this event, it is commonly accepted practice to say that the characteristics are different. We recommend that users report only those differences that are significant at the 10 percent level or better. Of course, sometimes this conclusion will be wrong. When the characteristics are the same, there is a 10 percent chance of concluding that they are different.

Note that as more tests are performed, more erroneous significant differences will occur. For example, at the 10 percent significance level, if 100 independent hypothesis tests are performed in which there are no real differences, it is likely that about 10 erroneous differences will occur. Therefore, the significance of any single test should be interpreted cautiously.

Note Concerning Small Estimates and Small Differences. Because of the large standard errors involved, there is little chance that estimates will reveal useful information when computed on a base smaller than 200,000. Also, nonsampling error in one or more of the small number of cases providing the estimate can cause large relative error in that particular estimate. Care must be taken in the interpretation of small differences since even a small amount of nonsampling error can cause a borderline difference to appear significant or not, thus distorting a seemingly valid hypothesis test.

Standard Error Parameters and Their Use. Most SIPP estimates have greater standard errors than those obtained through a simple random sample because PSUs are sampled and clusters of living quarters are sampled for the SIPP in the area and new construction frames. To derive standard errors that would be applicable to a wide variety of estimates and could be prepared at a moderate cost, a number of approximations were required. Estimates with similar standard error behavior were grouped together and two parameters (denoted a and b) were developed to approximate the standard error behavior of each group of estimates. Because the actual standard error behavior was not identical for all estimates within a group, the standard errors computed from these parameters provide an indication of the order of magnitude of the standard error for any specific estimate. These a and b parameters vary by characteristic and by demographic subgroup to which the estimate applies. Table 2 provides base a and b parameters to be used for the 2001 Panel Longitudinal estimates created using either the calendar year and the 9-Wave panel longitudinal weights.

In this section we discuss the adjustment of base "a" and "b" parameters to provide "a" and "b" parameters appropriate for each type of longitudinal and cross-sectional estimate described in the section "Use of Person Weights." Later sections will discuss the use of the adjusted parameters in various formulas to compute standard errors of estimated numbers, percents, averages, etc. Table 2 provide the base "a" and "b" parameters needed to compute the approximate standard errors for estimates using 9-Wave panel or calender year weights. Table 3 provides additional factors to be used for averages of monthly cross-sectional estimates. These factors are needed for two reasons: the monthly estimates are correlated and averaging over a greater number of monthly estimates will produce an average with a smaller standard error. Table 5 gives correlations between quarterly and yearly averages of cross-sectional estimates. These correlations are used in the formula for the standard error of a difference (Formula (9)).

The creation of appropriate "a" and "b" parameters for the previously discussed types of estimates are described below. Again, it is assumed that all four rotation groups are used in estimation. If not, refer to the section "Adjusting Standard Errors of Estimates Which Use Less Than the Full Sample."

1. The number of people who have ever experienced a characteristic during a given time period.

   The appropriate "a" and "b" parameters are taken directly from Table 2. The choice of parameter depends on the weights used, on the characteristic of interest, and on the demographic subgroup of interest.

2. Amount of a characteristic accumulated by people during a given time period.

   The appropriate "b" parameters are also taken directly from Table 2.

3. The average number of consecutive months of possession of a characteristic per spell (i.e., the average spell length for a characteristic) during a given time period.

   Start with the appropriate base "a" and "b" parameters from Table 2. The parameters are then inflated by an additional factor, g, to account for people who experience multiple spells during the time period of interest. This factor is computed by:

$$g = \frac{\sum_{i=1}^{n} m_i^2}{\sum_{i=1}^{n} m_i}, \qquad (1)$$

   where there are n people with at least one spell and m_i is the number of spells experienced by person I during the time period of interest.

4. The number of month-to-month changes in the status of a characteristic (i.e., number of transitions) summed over every set of two consecutive months during the time period of interest.

   Obtain a set of adjusted "a" and "b" parameters exactly as just described in 3, then multiply these parameters by an additional factor. Use 1.0000 if the time period of interest is two months and 2.0000 for a longer time period. (The factor of 2.0000 is based on the conservative assumption that each spell produces two transitions within the time period of interest.)

5. Monthly estimates of a characteristic averaged over a number of consecutive months.

   Appropriate base "a" and "b" parameters are taken from Table 2. If more than one longitudinal weight has been used in the monthly average, then there is a choice of parameters from Table 2. Choose the table which gives the largest parameter. Next multiply the base "a" and "b" parameters by the factor from Table 3 corresponding to the number of months in the average.

Adjusting Standard Error Parameters for Estimates which Use Less Than the Full Sample. If some rotation groups are unavailable to contribute data to a given estimate, then the estimate and its standard error need to be adjusted. The adjustment of the estimate is described in a previous section. The standard error of a longitudinal estimates (type 1-4) is adjusted by multiplying the appropriate “a” and “b” parameters by a factor equal to four divided by the number of rotation groups contributing data to the estimate. Note that the parameters for the standard error of an average must still be adjusted according to this rule, even though the average itself is unaffected by the adjustment for missing rotation groups.

For the standard error of cross-sectional estimates which cover only one month, the factor can be computed as just described or it can be taken from Table 3 where the factor is given for each single reference month, October 2000 to December 2003. For the standard error of quarterly averages of month estimates which use less than the full sample, special factors are used, also given in Table 3 for the fourth quarter of 2000 to the fourth quarter of 2003.

Standard Errors of Estimated Numbers. The approximate standard error, s_x, of an estimated number of people may be obtained by using the formula:

$$s_x = \sqrt{ax^2 + bx} \tag{2}$$

Here x is the size of the estimate and a and b are the parameters associated with the particular type of characteristic being estimated. Note that this method should not be applied to dollar values.

<u>Illustration.</u>
Suppose the SIPP estimate of the number of people ever receiving Social Security during the first three months of 2002 is 38,122,000. (This estimate is obtained using the 2002 Calendar year weight.) The appropriate "a" and "b" parameters to use in calculating a standard error for the estimate are obtained from Table 2. They are a = -0.00004218, b = 9,328, respectively. Using Formula (2), the approximate standard error is

$$\sqrt{(-0.00004218)(38{,}122{,}000)^2 + (9{,}328)(38{,}122{,}000)} = 542{,}496 \ \textit{persons}$$

The 90-percent confidence interval as shown by the data is from 37,229,593 to 39,014,407. Therefore, a conclusion that the average estimate derived from all possible samples lies within a range computed in this way would be correct for roughly 90 percent of all samples. Similarly, the 95-percent confidence interval as shown by the data is from 37,058,707 to 39,185,293 and we could conclude that the average estimate derived from all possible samples lies within this interval.

Standard Error of a Mean. A mean is defined here to be the average quantity of some item (other than people, families, or households) per person. For example, it could be the annual household income of females age 25 to 34. The standard error of a mean can be approximated by Formula (3) below. Because of the approximations used in developing Formula (3), an estimate of the standard error of the mean obtained from this formula will generally underestimate the true standard error. The formula used to estimate the standard error of a mean $\bar{x}$ is

$$s_{\bar{x}} = \sqrt{\left(\frac{b}{y}\right) s^2} \tag{3}$$

where y is the size of the base, s^2 is the estimated population variance of the item and b is the parameter associated with the particular type of item.

The population variance s^2 may be estimated by one of two methods. In both methods, we assume x_i is the value of the item for unit "I." (Unit may be person, family, or household). To use the first method, the range of values for the item is divided into "c" intervals. The upper and lower boundaries of interval j are Z_{j-1} and Z_j, respectively. Each unit is placed into one of "c" groups such that $Z_{j-1} < x_i < Z_j$.

The estimated population mean, $\bar{x}$, and variance, s^2, are given by the formulas:

$$\begin{aligned} \bar{x} &= \sum_{j=1}^{c} p_j m_j \\ s^2 &= \sum_{j=1}^{c} p_j m_j^2 - \bar{x}^2, \end{aligned} \tag{4}$$

where p_j is the estimated proportion of units in group j, and $m_j = (Z_{j-1} + Z_j)/2$. The most representative value of the item in group j is assumed to be m_j. If group "c" is open-ended, or there exists no upper interval boundary, then an approximate value for m_c is

$$m_c = \frac{3}{2} Z_{c-1} .$$

In the second method, the estimated population mean, $\bar{x}$, and variance, s^2, are given by the formulas

$$\bar{x} = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}$$

$$s^2 = \frac{\sum_{i=1}^{n} w_i x_i^2}{\sum_{i=1}^{n} w_i} - \bar{x}^2, \qquad (5)$$

where there are n units with the item of interest and w_i is the final weight for unit "I" (note that $\sum w_i = y$).

Illustration of Method 1.
Suppose that the 2002 distribution of annual incomes is given in Table 4 for people aged 25 to 34 who were employed for all 12 months of 2002.

The mean annual cash income from following formula is

$$\bar{x} = \frac{1,371}{39,851}(2,500) + \frac{1,651}{39,851}(6,250) + \ldots + \frac{1,493}{39,851}(105,000) = \$26,717.$$

Using Formula (4) and the mean annual cash income of \$26,717 the estimated population variance, s^2, is

$$s^2 = \frac{1,371}{39,851}(2,500)^2 + \frac{1,651}{39,851}(6,250)^2 + \ldots + \frac{1,493}{39,851}(105,000)^2 - (26,717)^2 = 468,331,633.$$

The appropriate "b" parameter from Table 2 is 7,328. Now, using Formula (3), the estimated standard error of the mean is

$$s_{\bar{x}} = \sqrt{\frac{7,328}{39,851,000}(468,331,633)} = \$293$$

Illustration of Method 2.

Suppose that we are interested in estimating the average length of spells of food stamp recipiency during the calendar year 2002 for a given subpopulation. Also, suppose there are only 10 sample people in the subpopulation who were food stamp recipients. (This example is a hypothetical situation used for illustrative purposes only; actually, 10 sample cases would be too few for a reliable estimate and their weights could be substantially different from those given.) The number of consecutive months of food stamp recipiency during 2002 and the 9-Wave panel weights are given below for each sample person:

Sample Person	Spell Length (in months)	Final Weight
1	4,3	5,300
2	5	7,100
3	9	4,900
4	3,3,2	6,500
5	12	9,200
6	12	5,900
7	4,1	7,600
8	7	4,200
9	6	5,500
10	4	5,700

Using the following formula , the average spell of food stamp recipiency is estimated to be

$$\bar{x} = \frac{(5300)(4) + (5300)(3) + \ldots + (5700)(4)}{5300 + 5300 + \ldots + 5700}$$

$$= 473{,}100/87{,}800$$

$$= 5.4 \ \textit{months}$$

The standard error will be computed by Formula (3). First, the estimated population variance can be obtained by Formula (5):

$$s^2 = \frac{(5300)(4)^2 + (5300)(3)^2 + \ldots + (5700)(4)^2}{5300 + 5300 + \ldots + 5700} - (5.4)^2$$

$$= 12.4 \ (months)^2$$

Next, the base "b" parameter of 9,210 is taken from Table 2 and multiplied by the factor computed from Formula (1):

$$g = \frac{2^2 + 1 + 1 + 3^2 + 1 + 1 + 2^2 + 1 + 1 + 1}{2 + 1 + 1 + 3 + 1 + 1 + 2 + 1 + 1 + 1}$$

$$= 1.71$$

Therefore, the final "b" parameter is 15,749, and the standard error of the mean is:

$$s = \sqrt{\frac{15{,}749}{87{,}800}(12.4)} = 1.49 \ months$$

Standard error of an Aggregate. An aggregate is defined to be the total quantity of an item summed over all the units in a group. The standard error of an aggregate can be approximated using Formula (6).

As with the estimate of the standard error of a mean, the estimate of the standard error of an aggregate will generally underestimate the true standard error. Let y be the size of the base, s^2 be the estimated population variance of the item obtained using Formula (4) or Formula (5) and b be the parameter associated with the particular type of item. The standard error of an aggregate is:

$$s_x = \sqrt{(b)(y)s^2} \qquad (6)$$

Standard Errors of Estimated Percentages. The reliability of an estimated percentage, computed using sample data for both numerator and denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentages, particularly if the percentages are 50 percent or more, e.g., the percent of people employed is more reliable than the estimated number of people employed. When the numerator and denominator of the percentage have different parameters, use the parameter (and appropriate factor) of the numerator. If proportions are presented instead of percentages, note that the standard error of a proportion is equal to the standard error of the corresponding percentage divided by 100.

There are two types of percentages commonly estimated. The first is the percentage of people sharing a particular characteristic such as the percent of people owning their own home. The second type is the percentage of money or some similar concept held by a particular group of people or held in a particular form. Examples are the percent of total wealth held by people with high income and the percent of total income received by people on welfare.

For the percentage of people, the approximate standard error, $s_{(x,p)}$, of the estimated percentage p may be approximated by the formula

$$s_{(x,p)} = \sqrt{\frac{b}{x}(p)(100-p)}. \tag{7}$$

Here x is the size of the subclass of social units which is the base of the percentage, p is the percentage $(0 < p < 100)$, and b is the parameter associated with the characteristic in the numerator.

<u>Illustration.</u>
Suppose that using the 4-Wave weight, it was estimated that 46,023,000 males were employed in July 2001 and an estimated 2.4 percent of them became unemployed in August 2001. The base "b" parameter is 6,014 (from Table 2). Using Formula (7) and the appropriate "b" parameter, the approximate standard error is

$$\sqrt{\frac{(6{,}014)}{(46{,}023{,}000)}(2.4)(100-2.4)} = 0.17 \ percent.$$

Consequently, the 90-percent confidence interval as shown by these data is from 2.11 to 2.69 percent.

For percentages of money, a more complicated formula is required. A percentage of money will usually be estimated in one of two ways. It may be the ratio of two aggregates:

$$p_I = 100\ (x_A / x_N)$$

or it may be the ratio of two means with an adjustment for different bases:

$$p_I = 100 \; (\hat{p}_A \; \bar{x}_A \; / \; \bar{x}_N)$$

where x_A and x_N are aggregate money figures, $\bar{x}_A$ and $\bar{x}_N$ are mean money figures, and $\hat{p}_A$ is the estimated number in group A divided by the estimated number in group N. In either case, we estimate the standard error
as

$$s_I = \sqrt{\left(\frac{\hat{p}_A \bar{x}_A}{\bar{x}_N}\right)^2 \left[\left(\frac{s_p}{\hat{p}_A}\right)^2 + \left(\frac{s_A}{\bar{x}_A}\right)^2 + \left(\frac{s_B}{\bar{x}_N}\right)^2\right]} \;, \qquad (8)$$

where s_p is the standard error of $\hat{p}_A$, s_A is the standard error of $\bar{x}_A$ and s_B is the standard error of $\bar{x}_N$. To calculate s_p, use Formula (7). The standard errors of $\bar{x}_N$ and $\bar{x}_A$ may be calculated using Formula (3).

It should be noted that there is frequently some correlation between $\hat{p}_A$, $\bar{x}_N$ and $\bar{x}_A$. Depending on the magnitude and sign of the correlations, the standard error will be over or underestimated.

Illustration.
Suppose that in October 2002 an estimated 8.8% of males 16 years and over were black, the mean monthly earnings of these black males was \$1288, the mean monthly earnings of all males 16 years and over was \$1911, and the corresponding standard errors are .28%, \$36, and \$27. Then, the percent of male earnings made by blacks in October 2002 is:

$$p_M = .088 \left(\frac{1288}{1911}\right) x \; 100$$

$$= 5.9\%$$

Using Formula (8), the approximate standard error is:

$$s_M = \sqrt{\left(\frac{(.088)(1288)}{1911}\right)^2 \left[\left(\frac{.0028}{.0880}\right)^2 + \left(\frac{36}{1288}\right)^2 + \left(\frac{27}{1911}\right)^2\right]}$$

$$= 0.26\%$$

Standard Error of a Difference. The standard error of a difference between two sample estimates is approximately equal to

$$s_{(x-y)} = \sqrt{s_x^{\,2} + s_y^{\,2} - r\, s_x\, s_y}\ , \tag{9}$$

where s_x and s_y are the standard errors of the estimates x and y. The estimates can be numbers, percents, ratios, etc. The correlation between x and y is represented by r. Some correlations are given in Table 5. The above formula assumes that the correlation coefficient between the characteristics estimated by x and y is non-zero. If no correlations has been provided for a given set of x and y estimates, assume r = 0. However, if the correlation is really positive (negative), then this assumption will tend to cause overestimates (underestimates) of the true standard error.

Illustration.
Suppose that SIPP estimates show the number of people age 35-44 years with annual cash income of $50,000 to $59,999 was 3,186,000 in 2002 and the number of people age 25-34 years with annual cash income of $50,000 to $59,999 in the same time period was 2,619,000. Then, using parameters from Table 2 and Formula (2), the standard errors of these numbers are approximately 160,274 and 145,506, respectively. The difference in sample estimates is 567,000 and using Formula (9), the approximate standard error of the difference is

$$\sqrt{(160{,}274)^2 + (145{,}506)^2} = 216{,}471\ .$$

Suppose that it is desired to test at the 10 percent significance level whether the number of people with annual cash income of $50,000 to $59,999 was different for people age 35-44 years than for people age 25-34 years. To perform the test, compare the difference of 567,000 to the product $1.6 * 216{,}471 = 346{,}354$. Since the difference is larger than 1.6 times the standard error of the difference, the data show that the two age groups are significantly different at the 10 percent significance level

Standard Error of a Median. The median quantity of some item such as income for a given group of people is that quantity such that at least half the group have as much or more and at least half the group have as much or less. The sampling variability of an estimated median depends upon the form of the distribution of the item as well as the size of the group. To calculate standard errors on medians, the procedure described below may be used.

The median, like the mean, can be estimated using either data which has been grouped into intervals or ungrouped data. If grouped data are used, the median is estimated using Formulas (10) or (11) with p = 0.5. If ungrouped data are used, the data records are ordered based on the value of the characteristic, then the estimated median is the value of the characteristic such that the weighted estimate of 50 percent of the subpopulation falls at or below that value and 50 percent is at or above that value. Note that the method of standard error computation which is presented here requires the use of grouped data. Therefore, it should be easier to compute the median by grouping the data and using Formulas (10) or (11).

An approximate method for measuring the reliability of an estimated median is to determine a confidence interval about it. (See the section on sampling variability for a general discussion of confidence intervals.) The following procedure may be used to estimate the 68-percent confidence limits and hence the standard error of a median based on sample data.

1. Determine, using Formula (7), the standard error of an estimate of 50 percent of the group.

2. Add to and subtract from 50 percent the standard error determined in step 1.

3. Using the distribution of the item within the group, calculate the quantity of the item such that the percent of the group with more of the item is equal to the smaller percentage found in step 2. This quantity will be the upper limit for the 68-percent confidence interval. In a similar fashion, calculate the quantity of the item such that the percent of the group with more of the item is equal to the larger percentage found in step 2. This quantity will be the lower limit for the 68-percent confidence interval.

4. Divide the difference between the two quantities determined in step 3 by two to obtain the standard error of the median.

To perform step 3, it will be necessary to interpolate. Different methods of interpolation may be used. The most common are simple linear interpolation and Pareto interpolation. The appropriateness of the method depends on the form of the distribution around the median. If density is declining in the area, then we recommend Pareto interpolation. If density is fairly constant in the area, then we recommend linear interpolation. Note, however, that Pareto interpolation can never be used if the interval contains zero or negative measures of the item of interest. Interpolation is used as follows. The quantity of the item such that p percent have more of the item is

$$X_{pN} = exp\left[\left(Ln\left(\frac{pN}{N_1}\right) \Bigg/ Ln\left(\frac{N_2}{N_1}\right)\right) \quad Ln\left(\frac{A_2}{A_1}\right)\right] A_1 \ . \tag{10}$$

if Pareto Interpolation is indicated and

$$X_{pN} = \left[\frac{pN-N_1}{N_2-N_1} \quad (A_2-A_1) + A_1\right] \tag{11}$$

if linear interpolation is indicated, where

N	is the size of the group,
A_1 and A_2	are the lower and upper bounds, respectively, of the interval in which X_{pN} falls,
N_1 and N_2	are the estimated number of group members owning more than A_1 and A_2, respectively,
exp	refers to the exponential function and
Ln	refers to the natural logarithm function

Illustration.
To illustrate the calculations for the sampling error on a median, we return to Table 4. The median annual income for this group is $18,318. The size of the group is 39,851,000.

1. Using Formula (7), the standard error of 50 percent on a base of 39,851,000 is about 0.72 percentage points.

2. Following step 2, the two percentages of interest are 49.28 and 50.72.

3. By examining Table 4, we see that the percentage 49.28 falls in the income interval from 17,500 to 19,999. (Since 55.5% receive more than $17,500 per month, the dollar value corresponding to 49.33 must be between $17,500 and $19,999). Thus, $A_1 = \$17{,}500$, $A_2 = \$19{,}999$, $N_1 = 22{,}106{,}000$, and $N_2 = 16{,}307{,}000$.

In this case, we decided to use Pareto interpolation. Therefore, the upper bound of a 68% confidence interval for the median is

$$\$17{,}500 \ \exp\left[\left(Ln\left(\frac{(.4933)(39{,}851{,}000)}{22{,}106{,}000}\right) \Big/ Ln\left(\frac{16{,}307{,}000}{22{,}106{,}000}\right)\right) Ln\left(\frac{19{,}999}{17{,}500}\right)\right] = \$18{,}425 \ .$$

Also by examining Table 4, we see that 50.72 falls in the same income interval. Thus, A_1, A_2, N_1, and N_2 are the same. We also use Pareto interpolation for this case. So the lower bound of a 68% confidence interval for the median is

$$\$17{,}500 \ \exp\left[\left(Ln\left(\frac{(.5067)(39{,}851{,}000)}{22{,}106{,}000}\right) \Big/ Ln\left(\frac{16{,}307{,}000}{22{,}106{,}000}\right)\right) Ln\left(\frac{19{,}999}{17{,}500}\right)\right] = \$18{,}209 \ .$$

Thus, the 68-percent confidence interval on the estimated median is from $18,226 to $18,409. An approximate standard error is

$$\frac{\$18{,}425 - \$18{,}209}{2} = \$108.00 \;.$$

Standard Errors of Ratios of Means and Medians. The standard error for a ratio of means or medians is approximated by:

$$s_{\left(\frac{x}{y}\right)} = \sqrt{\left(\frac{x}{y}\right)^2 \left[\left(\frac{s_y}{y}\right)^2 + \left(\frac{s_x}{x}\right)^2\right]} \tag{12}$$

where x and y are the means or medians, and s_x and s_y are their associated standard errors. Formula (12) assumes that the means are not correlated. If the correlation between the population means estimated by x and y are actually positive (negative), then this procedure will tend to produce overestimates (underestimates) of the true standard error for the ratio of means.

Standard Errors Using SAS or SPSS. Standard errors and their associated variance, calculated by SAS or SPSS statistical software package, do not accurately reflect the SIPP's complex sample design. Erroneous conclusions will result if these standard errors are used directly. We provide adjustment factors by characteristics that should be used to correctly compensate for likely under-estimates. The factors called DEFF available in Table 2, must be applied to SAS or SPSS generated variances. The square root of DEFF can be directly applied to similarly generated standard errors. These factors approximate design effects which adjust statistical measures for sample designs more complex than simple random sample.

Table 1 - SIPP Panel 2001 Reference Months (horizontal) for Each Interview Month (vertical)

		2000			2001												2002												2003											
		4th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4th Quarter			1St Quarter			2nd Quarter			3rd Quarter			4th Quarter		
Month of Wave/Rotation		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Spt	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Spt	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Spt	Oct	Nov	Dec
Feb 01	1/1	1	2	3	4																																				
Mar	1/2		1	2	3	4																																			
Apr	1/3			1	2	3	4																																		
May	1/4				1	2	3	4																																	
Jun	2/1					1	2	3	4																																
July	2/2						1	2	3	4																															
Aug	2/3							1	2	3	4																														
Sept	2/4								1	2	3	4																													
Oct	3/1									1	2	3	4																												
Nov	3/2										1	2	3	4																											
Dec	3/3											1	2	3	4																										
Jan 02	3/4												1	2	3	4																									
Feb	4/1													1	2	3	4																								
Mar	4/2														1	2	3	4																							
Apr	4/3															1	2	3	4																						
May	4/4																1	2	3	4																					
Jun	5/1																	1	2	3	4																				
July	5/2																		1	2	3	4																			
Aug	5/3																			1	2	3	4																		
Sept	5/4																				1	2	3	4																	
Oct	6/1																					1	2	3	4																
Nov	6/2																						1	2	3	4															
Dec	6/3																							1	2	3	4														
Jan 03	6/4																								1	2	3	4													
Feb	7/1																									1	2	3	4												
Mar	7/2																										1	2	3	4											
Apr	7/3																											1	2	3	4										
May	7/4																												1	2	3	4									
Jun	8/1																													1	2	3	4								
July	8/2																														1	2	3	4							
Aug	8/3																															1	2	3	4						
Sep	8/4																																1	2	3	4					
Oct	9/1																																	1	2	3	4				
Nov	9/2																																		1	2	3	4			
Dec	9/3																																			1	2	3	4		
Jan 04	9/4																																				1	2	3	4

Table 2: SIPP Generalized Variance Parameters for Calendar Year 2001

Characteristics	Parameters		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.00003304	7222	2.54
Male	-0.00006861	7222	2.54
Female	-0.00006372	7222	2.54
Income and Labor Force	-0.00002751	6014	2.12
Male	-0.00005713	6014	2.12
Female	-0.00005306	6014	2.12
Other (Person) Items	-0.00003308	9226	3.25
Male	-0.00006777	9226	3.25
Female	-0.00006462	9226	3.25
Black (Person) Items	-0.00018678	6521	2.30
Male	-0.00040852	6521	2.30
Female	-0.00034410	6521	2.30
Hispanic (Person) Items	-0.00041514	10682	3.76
Male	-0.00080538	10682	3.76
Female	-0.00085676	10682	3.76
Metro/NonMetro (Person) Items	-0.00003385	9442	3.32
Male	-0.00006936	9442	3.32
Female	-0.00006613	9442	3.32
Households			
Total or White	-0.00003851	4158	1.46
Black	-0.00028501	3729	1.31
Hispanic	-0.00060181	4854	1.71
Metro/NonMetro	-0.00008730	9426	3.32

Table 2: SIPP Generalized Variance Parameters for Calendar Year 2002

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.00004218	9328	3.28
Male	-0.00008744	9328	3.28
Female	-0.00008149	9328	3.28
Income and Labor Force	-0.00003313	7328	2.58
Male	-0.00006869	7328	2.58
Female	-0.00006401	7328	2.58
Other (Person) Items	-0.00003644	10262	3.61
Male	-0.00007455	10262	3.61
Female	-0.00007127	10262	3.61
Black (Person) Items	-0.00024639	8684	3.06
Male	-0.00053838	8684	3.06
Female	-0.00045430	8684	3.06
Hispanic (Person) Items	-0.00044041	11299	3.98
Male	-0.00086184	11299	3.98
Female	-0.00090066	11299	3.98
Metro/NonMetro (Person) Items	-0.00006669	18783	6.61
Male	-0.00013646	18783	6.61
Female	-0.00013045	18783	6.61
Households			
Total or White	-0.00004412	4806	1.69
Black	-0.00034591	4610	1.62
Hispanic	-0.00071292	5852	2.06
Metro/NonMetro	-0.00011722	12770	4.50

Table 2: SIPP Generalized Variance Parameters for Calendar Year 2003

Characteristics	**Parameters**		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.00003862	8677	3.06
Male	-0.00007998	8677	3.06
Female	-0.00007467	8677	3.06
Income and Labor Force	-0.00003141	7057	2.48
Male	-0.00006505	7057	2.48
Female	-0.00006073	7057	2.48
Other (Person) Items	-0.00003804	10855	3.82
Male	-0.00007780	10855	3.82
Female	-0.00007443	10855	3.82
Black (Person) Items	-0.00024605	8775	3.09
Male	-0.00053841	8775	3.09
Female	-0.00045312	8775	3.09
Hispanic (Person) Items	-0.00049896	13048	4.59
Male	-0.00097982	13048	4.59
Female	-0.00101669	13048	4.59
Metro/NonMetro (Person) Items	-0.00005539	15806	5.57
Male	-0.00011329	15806	5.57
Female	-0.00010838	15806	5.57
Households			
Total or White	-0.00004300	4774	1.68
Black	-0.00034499	4699	1.65
Hispanic	-0.00075670	6525	2.30
Metro/NonMetro	-0.00009950	11047	3.89

Table 2: SIPP Generalized Variance Parameters for the Entire 9-Wave Panel

Characteristics	Parameters		
Individuals	***a***	***b***	**DEFF**
Poverty and Program Participation	-0.00004213	9210	3.24
Male	-0.00008752	9210	3.24
Female	-0.00008123	9210	3.24
Income and Labor Force	-0.00003743	8182	2.88
Male	-0.00007775	8182	2.88
Female	-0.00007216	8182	2.88
Other (Person) Items	-0.00004019	11209	3.95
Male	-0.00008236	11209	3.95
Female	-0.00007849	11209	3.95
Black (Person) Items	-0.00027485	9606	3.38
Male	-0.00060070	9606	3.38
Female	-0.00050669	9606	3.38
Hispanic (Person) Items	-0.00051913	13018	4.58
Male	-0.00100785	13018	4.58
Female	-0.00107054	13018	4.58
Metro/NonMetro (Person) Items	-0.00004198	11708	4.12
Male	-0.00008603	11708	4.12
Female	-0.00008199	11708	4.12
Households			
Total or White	-0.00004806	5187	1.83
Black	-0.00039378	5126	1.80
Hispanic	-0.00080219	6356	2.24
Metro/NonMetro	-0.00008106	8748	3.08

Table 3 - Factors to be Applied to Table 2 Base Parameters to Obtain Parameters for Various Reference Periods

# of available rotation months[4]	Factor
Monthly estimate	
1	4.0000
2	2.0000
3	1.3333
4	1.0000
Quarterly estimate	
6	1.8519
8	1.4074
9	1.2222
10	1.0494
11	1.0370

[4] The number of available rotation months for a given estimate is the sum of the number of rotations available for each month of the estimate.

Table 4 - Hypothetical Distribution of Annual Income Among People 25 to 34 Years Old

Intervals of Annual Cash Income	Total	under $5000	$5000 to $7499	$7500 to $9999	$10000 to $12,499	$12,500 to $14,999	$15,000 to $17,499	$17,500 to $19,999	$20,000 to $29,999	$30,000 to $39,999	$40,000 to $49,999	$50,000 to $59,999	$60,000 to $69,999	$70,000 and over
Mid-intervals of Annual Cash Income		2,500	6250	8750	11,250	13,750	16,250	18,750	25,000	35,000	45,000	55,000	65,000	105,000
Thousands in interval	39,851	1,371	1,651	2,259	2,734	3,452	6,278	5,799	4,730	3,723	2,519	2,619	1,223	1,493
Cumulative with at least as much as lower bound of interval		39,851	38,480	36,829	34,570	31,836	28,384	22,106	16,307	11,577	7,854	5,335	2,716	1,493
Percent with at least as much as lower bound of interval		100.0	96.6	92.4	86.7	79.9	71.2	55.5	40.9	29.1	19.7	13.4	6.8	3.7

Table 5 - Correlations between Estimates of the Same Characteristic at Two Points of Time. Both Estimates must be Monthly Estimates Averaged over Quarters or Years

	Quarterly Estimates				
	Consecutive Quarters	1 Quarter Apart	2 Quarters Apart	3 Quarters Apart	Calendar Year Estimates 2001 to 2002
INDIVIDUALS					
A. Both Estimates Created Using The Same Weight, Either 4 Wave, 7 Wave, or 9 Wave Weights					
Income					
Social Security or Private Pensions	0.97	0.86	0.75		
Other	0.72	0.63	0.54		
B. One Estimate Created Using An Annual Weight While The Other Estimate Is Created Using A Different Annual Weight					
Income					
Social Security or Private Pensions	0.81	0.72	0.63	0.55	0.70
Other	0.60	0.53	0.45	0.37	0.49
C.Both Estimates Created Using The 9 Wave (or Panel) Weight					
Income					
Social Security or Private Pensions	0.97	0.86	0.75	0.65	0.83
Other	0.72	0.63	0.54	0.46	0.58